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Inference of the Potential Predictability of Seasonal Land-Surface Climate

Thomas J. Phillips
Program for Climate Model Diagnosis and Intercomparison (PCMDI)
Lawrence Livermore National Laboratory, L-264
Livermore, California 94551, U.S.A.
Telephone: +1-510-422-0072
Facsimile: +1-510-422-7675
E-mail:phillips@pcmdi.llnl.gov

The seasonal potential predictability of some 10 land-surface variables is inferred from 6 realizations of decadal climate performed with the ECMWF (cycle 36) model from different atmosphere/land initial states, but with the same (AMIP) ocean and sea ice boundary conditions. The chosen variables are indicators of the dynamical and hydrological state of the land surface, and of the transfer of momentum and energy to the atmosphere.

As one measure of potential predictability, maps of zero-lag temporal Ocorrelations r(x,y) and time series of spatial (pattern) correlations s(t) are computed between the 15 independent pairs of seasonal anomalies of like variables in the ensemble of 6 integrations. The prospects for predicting a land-surface variable are assumed to be relatively promising where the ensemble mean of an anomaly correlation statistic is ~ 0.5 or higher.

Although doubtless somewhat dependent on the ECMWF model's parameterizations, the results imply that seasonal land-surface climate is potentially predictable over Amazonia, equatorial Africa, southern Asia, and northern Australia; the prospects for prediction are not generally promising elsewhere, especially in the extratropics. However, the predictability of seasonal land-surface climate is globally enhanced in the aftermath of an ENSO event.

There also is a considerable range in the potential predictability of different land-surface variables. Surface air temperature and pressure appear to be substantially more predictable than are surface momentum and sensible and latent heat fluxes; the predictability of ground temperature, radiative fluxes, precipitation and soil moisture fall in an intermediate range.

As an alternative measure of potential predictability, we also calculated where the fraction of interannual variance of each season that is attributable to the common ocean boundary forcing exceeds the (unpredictable) internal variability. These results, while qualitatively similar to those summarized above, also suggest that the potential predictability of land-surface climate varies with time of year.

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